Building Energy Information Systems: Organizational and End User Best Practices

Jessica Granderson
Ben Rosenblum
PI: Mary Ann Piette
Lawrence Berkeley National Laboratory

Dan Harris
New Buildings Institute

Kickoff Webinar, June 23rd 2010

http://eis.lbl.gov

Agenda

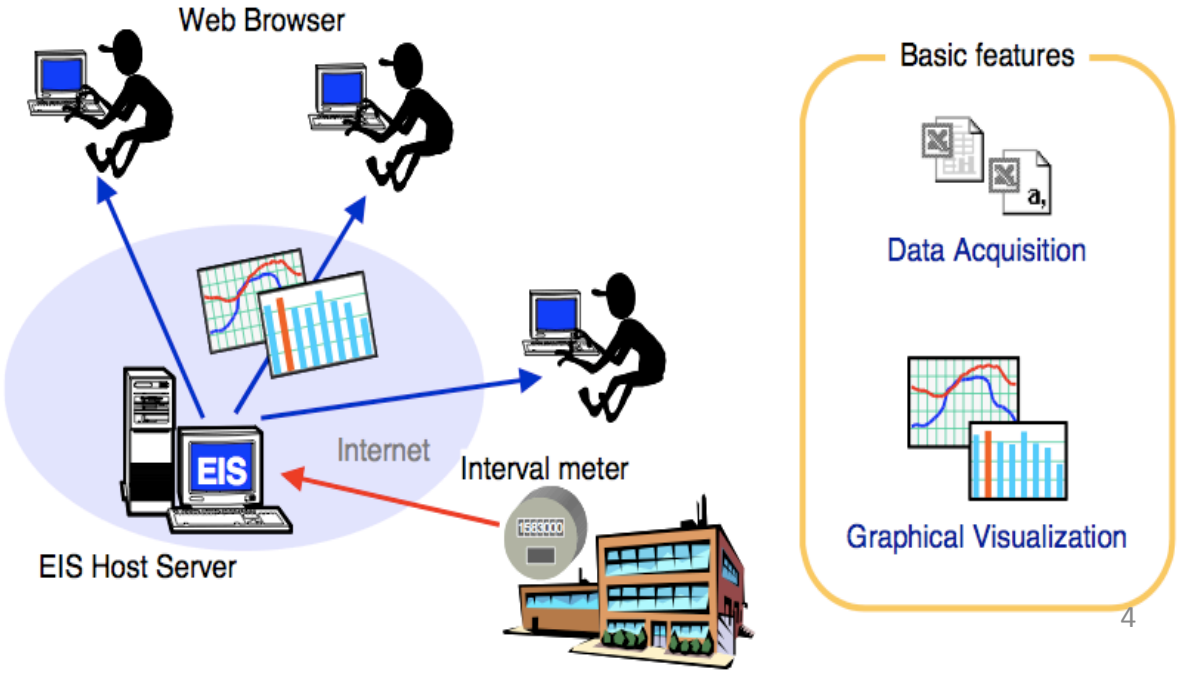
- Attendee introductions
- Kickoff webinar goals
- EIS technology definition and examples
- Prior work in EIS, current state of knowledge
- Current study objectives, process, questions
- Discussion, Q&A

Webinar Goals

1. Communicate project concept, topics of focus, and intended outcomes
2. Understand attendee roles and interests, and how they might participate (3 possible groups)
3. Feedback, discussion, and Q&A with the project team

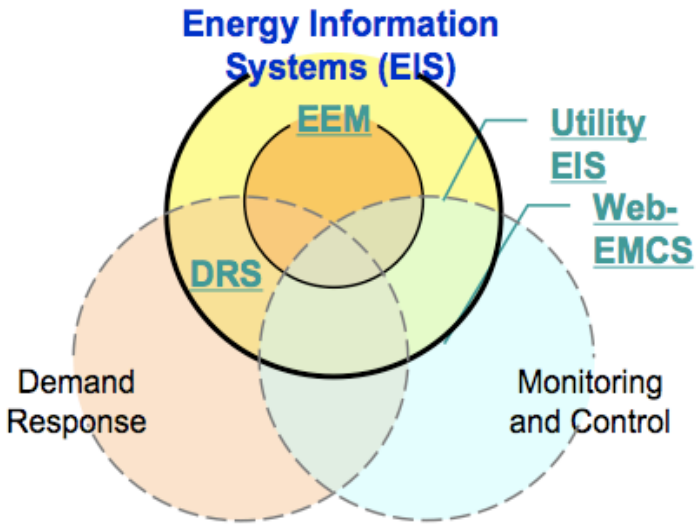
EIS Definition

- EIS comprise
  - Software, data acq. hardware, and communication systems
    - To collect, analyze and display building energy information



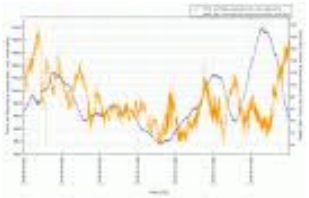
EIS Definition

- EIS provide
  - Web-accessible hourly whole-building electric data
  - Graphical/visualization capabilities, GUI front-end
  - Weather, energy price signals, and demand response (DR) information
- EIS are NOT
  - Most EMCS and equipment FDD
  - Energy information dashboards
  - Batch analysis tools
  - GHG footprint calculators
  - Environmental monitors



EIS Analytical Capabilities

- Meter/sensor time series, weather feeds to perform:
  - Energy consumption baselines
  - Load profiling
  - Portfolio or building benchmarking
  - Energy consumption anomaly detection
  - Efficiency measure M&V tracking
  - Forecasting
  - Energy costing
  - System efficiencies, end use analyses less common, but possible with submeter/component level data

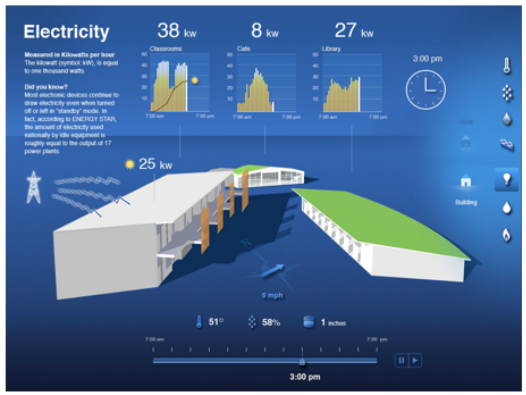


Representative EIS

Vendor	Technology	Intended Users or Facility Types
Agilewaves	The Resource Monitor	Energy managers, operators
Automated Energy		Commercial, enterprise, utility customers
Chevron Energy Solutions	Utility Vision	Energy managers
EnergyICT	EIServer and modules	Enterprises, utilities, multi-site
FactoryIQ	eMetrics	Large commercial, industrial
Gridlogix	Automated Enterprise Management	Enterprise
Integrated Building Solutions	Intelligent Building Interface System (IBIS)	Enterprise, commercial, industrial
Interval Data Systems	EnergyWitness	Enterprises, facility managers
Itron	EEM Suite	Energy managers
Matrikon	Operational Insight	Enterprise
NorthWrite	Energy WorkSite	Commercial, industrial, utility customers
Noveda	Facilimetrix	Facility managers
PowerLogic	Energy Profiler Online	Commercial
PowerLogic	Ion EEM	Enterprise, industrial
SAIC	Enterprise Energy Dashboard (E2D)	Enterprise and industrial facility, energy managers
Small Energy Group	Pulse Energy	Managers, owners, occupants
Tridium	Vykon Energy Suite	Facility and energy managers, owners, energy service providers
Ziphany	Energy operation, energy information, and DR platforms	Energy service and DR providers

Motivation to Study EIS

- 2 closely related concepts
  - Realizing optimal energy performance requires more granular, timely data than utility bills
  - EIS can process data into actionable information, and link key efficiency stakeholders
- Growing interest in energy displays, dashboards, performance visibility, and role of feedback in reducing energy use



Prior Work

2009 Study for the California Energy Commission, available at eis.lbl.gov

- State of the technology: Framework of 8-10 categories, 5-10 features each
  - Many EIS features have converged to a common set over time
  - Flexibility distinguishes many EIS
    - alteration of trending, plotting, and reporting parameters, and automated calculations
    - reconfiguration of reporting options
    - changes dynamic and on-the-fly or hard-coded
  - Robustness of energy analyses also distinguish EIS
  - Carbon tracking, DR capability, baselining and anomaly detection are new or more sophisticated in last ~5yrs

Prior Work

2009 Study for the California Energy Commission, available at eis.lbl.gov

- Case Studies
  - Data quality is increasingly important with submetering, component/ system monitoring, and non-electric energy sources
  - Resources and staffing were constraints in every case
  - Alternative models for effective, scalable EIS use need to be identified
  - Many EIS features are underused or not used
  - Technical basis of sophisticated features may not be understood by users, but can be used successfully
  - Common actions/saving relate to M&V, schedule verification, and inefficient operation
  - External software common with custom analyses and performance metrics

Prior Work, Current State of Knowledge

- Future research needs in 4 key areas
  - Features and usability
  - Anomaly detection and physical models
  - Technology definitions and scalability
  - Successful use and deployment models
- Small number of independent, case studies provide compelling evidence of EIS potential (up to 30% savings)
- Need for deeper understanding of how the technology is used, for what purposes, at what cost, and to what benefit

Agenda

- Attendee introductions
- Kickoff webinar goals
- EIS technology definition and examples
- Prior work in EIS, current state of knowledge
- Current study objectives, process, questions
- Discussion, Q&A

Best Practices Study Objectives

1. **Connect the dots:** points monitored, features used, efficiency 'catches', action taken, resulting energy/cost savings attributable to use of the technology
2. **Identify successful organizational practices** in acquiring, leveraging, acting upon EIS information, decision-making, in-house use vs. external services
3. **Understand key features**: diagnostics, most powerful features, common uses (e.g., M&V, benchmarking, carbon tracking, portfolio goal tracking, …)
4. **Identify best practices**

Best Practices Identification

Input from 3 participant groups

1. 6-8 case studies
   - 2-3 org contacts, ~3 days total commitment
   - site visit, phone interview, review documentation
2. Analytical service providers
   - ~1-2 days total commitment
   - 1 (web) workshop, follow up as needed, review documentation
3. Other owners/users, those in the process of implementing EIS, or considering doing so
   - Same as above

Best Practices Identification

Process

- Case study screening and selection (mid Jul)
- Conduct case studies (mid Oct)
- Workshop for service provider insights (Jul/Aug)
- Workshop for owner/user insights (Jul/Aug)
- Analyze participant input, follow up as necessary (Feb 2011)
- Draft best practices document, comment period, finalize (Jul 2011)
- Final findings webinar (Aug 2011)

Desired Case Study Characteristics

- At least 1 year of data and EIS use
- EIS power users with a high level of engagement
- Documented identification of waste, action taken, and resulting energy and cost savings from using the EIS
- Organizations with a specific energy plan or set of efficiency goals
- Members of DOE's Commercial Building Energy Alliances

Case Study Screening

Company/Building Name: **Contact Name:** **Email:** **Phone:**

Organization/Site Description

Portfolio or site size (sf):

Size of typical building (sf):

Number of buildings:

Principle building activity:

Location(s):

Number of EIS users:

Metrics used in energy management:

What is unique about your company's use of EIS?

What best practices would your case illustrate?

BAS/EMCS/EMS

Name and vendor:

Year acquired:

Protocol used to connect meters, sensors:

Energy Information System

Name and vendor:

Year implemented:

3rd party services (analysis, data cleansing, etc …), and provider name, if any:

Extent to which energy/cost savings from using the tool are documented
[Not at all, partially, comprehensively]:

EIS Meters and Sensors

Whole Building Fuel Meters
[List vendor or utility]

Electric:

Gas:

Other:

System Level Meters
[Description and vendor]

Electric:

Gas:

Other:

Equipment Level Meters
[Description and vendor]

Electric:

Gas:

Other:

Other Sensors Used in the EIS
[Type and vendor - temp, flow, occ …]

Best Practices Topics

- Case study organization and site descriptions
- EIS motivation, evaluation, and selection
- Preexisting and new hardware, EMCS, and EIS architecture
- EIS costs, installation, commissioning, training
- Organizational processes
- EIS energy savings and cost/benefit
- Detailed EIS use: organizational and site specifics
- Lessons learned
- Future EIS enhancement

Best Practices Questions

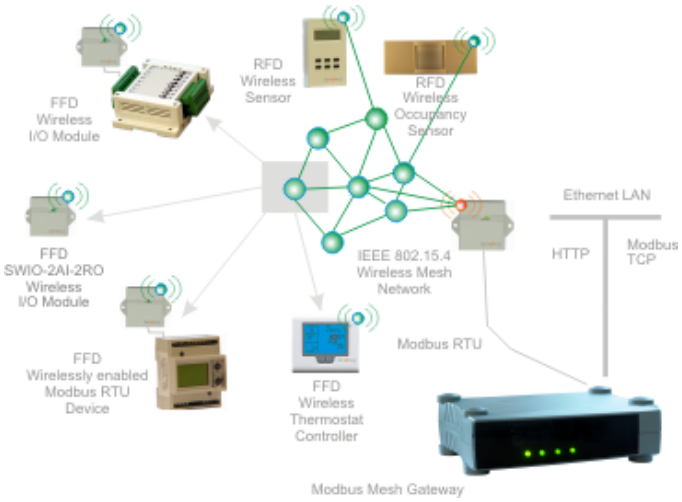
- What are the organizational and site energy goals, and what role does the EIS play in meeting them?
- What motivated the purchase of an EIS?
  - What was the motivation path, and was it top-down or bottom-up?
  - Who were the individuals who drove the process?
- How were EIS duties integrated into the organizational structure?
  - New roles added, new responsibilities, and staff resource allocation
- How many people or groups use the EIS and for what purposes (benchmarking, M&V, carbon reporting, cont. Cx …)?

Best Practices Questions

- Describe how EIS information flows between the site, organization, and third-party groups
  - Is any analysis or reporting outsourced to 3rd parties?
- How is actionable EIS information integrated into the organizational process?
  - What steps are taken from identifying an energy savings opportunity using EIS to implementing it?

Best Practices Questions

- Describe the EIS architecture, integration with new or preexisting EMCS, and/or DAQ systems
- What were the upfront costs, are the ongoing costs of the EIS?
  - How were costs structured (per point, one-time, annual, fees)?
- What annual energy and cost savings have been achieved since implementation of the EIS?



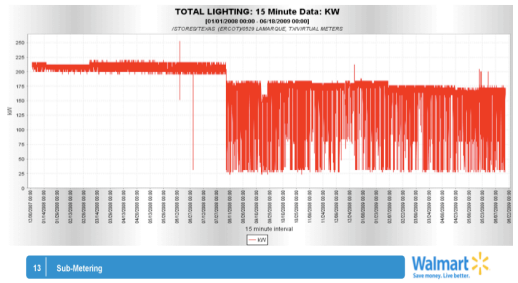
Best Practices Questions

- Describe the suite of analyses that are performed on a weekly/monthly/annual basis, including features used, points monitored, and order of investigations
  - What features are most useful?
  - What metrics are used, and how is consumption normalized?
- What information is exported to external software for further analysis and reporting?
  - What software is used and which is calculated?

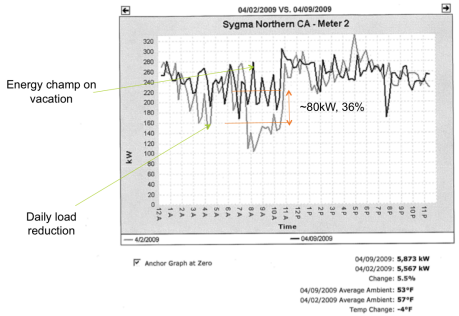
Best Practices Questions

- To what extent are sites submetered, and what was the balance between increased cost, data volume, and diagnostic ability?
- Provide specific examples of savings opportunities identified with the EIS, action taken, and resulting energy and cost savings

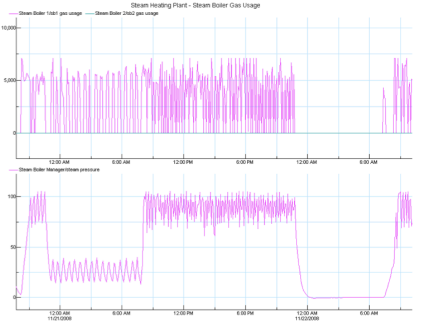
2009 report: Wal-Mart p.40



Sysco p.36



UC Merced p.32



Discussion

- Questions or comments for the research team?
- Any explicit feedback regarding
  - Additional best practice topics of focus that would be valuable?
  - Specific questions you'd like asked?
  - Suggested modifications to process to simplify participation or information gathering?

Next Steps

- LBNL to follow up with email including
  - Case study screening document (**return by Jul 5**)
  - Registration details for service providers and owners/users workshops
  - Best practices question set (**return comments by Jul 5**)